REMARKS

Claims 1-2 and 4 are pending in the present application. Claim 4 is withdrawn from consideration by the Examiner. No new matter has been presented.

Rejections under 35 USC §103(a)

Claims 1 and 2 were rejected under 35 USC §103(a) as being obvious over Sagawa et al. (U.S. Patent No. 5,194,098), and further in view of Nomura et al. (US 2004/0094237).

Responding to Applicant's previous response, the Examiner alleged as follows:

> Applicant is arguing the method of depositing the R-Fe-B film is by a physical forming method. However, applicant is not claiming a method of deposition. The method of deposition is different, however, since applicant is claiming a rare earth magnet, the rare earth magnet of Sagawa et al. US 5,194,098, and further in view of Nomura et al. US 200410094237 would necessarily be similar to applicants claim.
>
> The product is taught to have the same R-Fe-B components.

(Office Action, page 4, lines 9-14). However, the present invention is directed to an "R-Fe-B alloy based thin film magnet," which is a deposited product as a thin film but not a bulk material. Also, claim 1 describes the structure of the product by the recitation "wherein the alloy film has a thickness is 0.2 to 400μm, and wherein the R-Fe-B based alloy has a composite texture comprising $R_2Fe_{14}B$ crystals grown by heat treatment of said alloy film and having a crystal grain diameter of 3 to 30μm which is larger than a single-magnetic-domain graindiameter and R-element-rich grain boundary phases formed by the heat treatment present at boundaries between the crystals, and having a nucleation type coercive force."

The thin film magnet deposited by a physical film forming method and the magnet by powder metallurgical process are different in their history and their material scientific properties. As explained in the specification at page 2-3, the thickness of the thin film magnet formed on a base material, e.g., a flat plate or a shaft, is about several micrometers to several tens of micrometers, and in many cases, it is one-several tenth to one-hundredth of the four sides of the flat plate or the diameter of the shaft. When this thin film is magnetized in a direction perpendicular to the flat plate surface or the circumferential surface of the shaft, a demagnetizing field is increased significantly, and adequate magnetization is not performed.

Therefore, it becomes difficult to exploit the magnetic characteristics inherent in the thin film magnet. It has been generally known that the magnitude of the demagnetizing field depends on the ratio of the dimension of magnet in the magnetization direction to the dimension in the direction orthogonal thereto, and is increased as the dimension in the magnetization direction, i.e., film thickness direction, is decreased.

The present inventors have conducted intensive research on the composition and the crystal texture for the purpose of improving the magnetization characteristics of the thin film magnet. As a result, they succeeded in the preparation of a thin film magnet having a nucleation type coercive force mechanism comparable to sintered magnets. This is a significant break through of the thin film magnet technology.

Claim 1 recites "wherein the R-Fe-B based alloy has a composite texture comprising $R_2Fe_{14}B$ crystals grown by heat treatment of said alloy film and **having a crystal grain diameter of 3 to 30 μm**," which is greater than a single-magnetic-domain grain diameter. It is known that single-magnetic-domain grain diameters are less than 0.3 μm. Therefore, when a crystal grain

diameter becomes 3 μm or more, the crystal grain becomes a multi-magnetic-domain structure. The present invention recites "**a crystal grain diameter of 3 to 30 μm**" in order to make the R-Fe-B alloy based thin film magnet have a multi-magnetic-domain structure. On the other hand, if the grain diameter exceeds 30 μm, the number of magnetic domains present in one crystal becomes too many, inversion of magnetization tends to occur and, thus, a necessary coercive force will not be obtained even when the grain boundary phases are formed (see the present specification page 11, lines 2-7).

In the R-Fe-B based thin film magnet according to the present invention, the c axes (easy to magnetize) of R2Fe14B crystals are uniformly oriented easily. Also, in the present invention, the magnetization characteristics are improved regardless of whether the c axes are oriented or not.

Sagawa et al. describes "In the Fe-B-R base permanent magnets of the present embodiment, Hc of 1 kOe or higher is obtained when the mean crystal grain size ranges from 1 to 80 μm, while Hc of 4 kOe or higher is obtained in a range of 2 to 40 μm" (Sagawa, column 6, lines 42-46). However, it is clear that the grain size range of Sagawa et al. is of a single-magnetic-domain from the description as follows:

> **When the crystal grain size exceeds 80 μm, the obtained particles are not single magnetic domain particles**, and include magnetic walls therein, so that the inversion of magnetization easily takes place, thus leading to a drop in Hc. A grain size of no more than 80 μm is required to obtain Hc of no less than 1 kOe. Refer to FIG. 6.

(Sagawa, column 6, lines 64-68).

> A sample having the same composition as No. 4 given in Table 3 and other samples were studied in detail in respect of the relationship between their mean crystal grain size D and Hc. The results are illustrated in FIG. 6, from which it is found that Hc peaks when D is approximately in a range of 3- μm, decreases steeply when D is below that range, and drops moderately when D is above that range. Even when the composition varies within the scope as

> defined in the present invention, the relationship between the average crystal grain size D and Hc is substantially maintained. **This indicates that the Fe-B-R system magnets are the single domain-particulate type magnets.**

(Sagawa, column 13, lines 14-26).

Thus, the sintered magnet of Sagawa et al. is a single-domain-particulate-type magnet. If a physically deposited film is made into a single-domain-particulate-type magnet, the grains size must be less than 0.3 μm. In contrast, the present invention utilizes a multi-magnetic-domain structured crystal of 3 μm or more.

The Examiner alleged that the R-Fe-B-alloy-based thin film magnet of the present invention is obvious because Sagawa et al. describes: "The permanent magnets according to the present invention are prepared by a so-called powder metallurgical process, i.e. sintering, and can by formed into any desired shape and size, as already mentioned" (col. 5, lines 39-46).

However, Sagawa at al. also describes as follows: "However, these materials are all obtained by sputtering in the form of thin films that cannot be generally used as magnets for, e.g., speakers or motors." (col. 1, line 59-62, Background of the Invention); or 'These melt-quenched ribbons or sputtered thin films are not any practical permanent magnets (bodies) that can be used as such" (col. 2, line 9-11). Sagawa at al. further describes: "Since both the sputtered thin films and the meltquenched ribbons are magnetically isotropic by nature, it is indeed almost impossible to obtain therefrom magnetically anisotropic (herein below referred to "anisotropic") permanent magnets for the practical purpose." (col. 2, line 22-26).

Thus, Sagawa et al. indicates that thin films are not suitably used as magnets. Sagawa et al. rather teaches away from obtaining an R-Fe-B alloy based thin film magnet physically deposited. Also, powder metallurgical process is not a suitable process for manufacturing a thin film product.

Thus, there is no reason for a person of ordinary skill in the art to combine the teaching of Sagawa at al. with a thin film magnet.

The Examiner also alleged that the present invention is obvious because "the powder can be compressed and sintered into any desired shape and size." However, it is extremely difficult to make a thin film of a thickness of 400μm or less. Also, magnetic properties are significantly different between the thin film magnet and sintered magnet. Nomura et al. also discusses sintered magnet.

Therefore, again, there is no reason for a person of ordinary skill in the art to combine the teaching of Sagawa at al. and Nomura et al. with a thin film magnet.

For at least these reasons, claim 1 patentably distinguishes over Sagawa et al. and Nomura et al. Claim 2, depending from claim 1, also patentably distinguishes over Sagawa et al. and Nomura et al. for at least the same reasons.

In view of the aforementioned remarks, Applicants submit that the claims are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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